

gqgbwmsn cwj‡UKwbK
Bbw÷wUDU,
gqgbwmsn|
cÖwZôv‡bi †KvWt 57067
‡UK‡bvjwRt B‡jK‡U^av‡gwWKvj
‡UK‡bvjwR †KvWt 86

AVMIZ



wkyK cwiwPwZ
#gvt gwngyji nvmvb
mygb



Rywbqi B'U^av±i
(B#jK#U^av#gwWKvj)
gqgbwmsn cwj#UKwbK
Bbw÷wUDU,
gqgbwmsn|
#gvevt 01992008229

welq cwiwPwZ

welq̄i bvḡt dvBevi AcwU· AÿÛ
†jRvi Bb †gwWKÿj wdì
welq †KvWt 28652
ce©t cÂg
wkdUt 1g/2q

Aaüq cwiwPwZ

Aaüq - 01

#jRvi Gi wdwR.

Av†jvP¨welq

- †jRvi Kx?
- †jRv†ii êwkó;†jv Kx Kx?
- †jRv†ii †kÖwYwefvM Kx Kx ?
- †jRvi cvwαús Kv†K e†j?
- †jRv†ii eënvī †Kv_vq?

†jRvi (LASER) Kx?

LASER Gi c~Y© ifc Light Amplification
by Stimulated Emission of Radiation|

A_©vr wewKi†Yi DİxwcZ wbtmiY Øviv
Av†jvi weea©b†K †jRvi e†j|

$\exists x \forall y (x \neq y \rightarrow \exists z (z \neq x \wedge z \neq y))$ Kx Kx?

1. $\exists x \forall y (x \neq y \rightarrow \exists z (z \neq x \wedge z \neq y))$
2. $\exists x \forall y (x \neq y \rightarrow \exists z (z \neq x \wedge z \neq y))$
3. $\exists x \forall y (x \neq y \rightarrow \exists z (z \neq x \wedge z \neq y))$

#jRv#ii †kÖwYwefvM Kx Kx?

#jRvi Av#jv#K 5wU †kÖwY#Z fvM Kiv n#q#Q|

1. $K \rightarrow vm$ 1 t wbivc`|
2. $K \rightarrow vm$ 2 Gg t `„kögvb †jRvi, `~N©Ubv~jK
G·#cvRv#ii †j#Î wbivc`|
3. $K \rightarrow vm$ 3 Avi t wbivc` bq, Kg SzwK|
4. $K \rightarrow vm$ 3we t wec`RbK|
5. $K \rightarrow vm$ 4 t wec`RbK I Av, #bi SzwK Av#Q|

†jRvi cvwαús Kx?

†h cÖwμqvq gva^ag†K mwμq Kiv nq †m
cÖwμqv†K †jRvi cvαúws e†j| DÏxwcZ
Zi^{1/2}%o`N©` †_†K wfbœ Zi^{1/2}%o`†N©`
B†jK†U^avgvM†bwUK Gbvwr©†K gva†gi wfZi
cÖ†ek Kwi†q cvwαús KvR mαúboe Kiv nq|

†jRv†ii eënvî †Kv_vq?

wPwKrmv †j†Î mvaviYZ bvK, Kvb I †VvuU
mvR©vwi, wbD†iv mvR©vwi, cvK~'jxi
Avjmvî, wUDgvi, KÿÝvi wPwKrmvq, eÜ nIqv
wkiv ev agbxi gyL Lyj†Z, †PvL I Pg©†iv†Mi
wPwKrmvq †jRvi eënvî Kiv nq|

wkLbdj

- †jRvi mαú†K© aviYv jvf Ki†Z cvi†e|
- †jRv†ii êwkó,†jv Rvb†Z cvi†e|
- †jRv†ii †kÖwYwefvM Kx Kx Zv Rvb†Z cvi†e|
- †jRvi cvwαús mαú†K© aviYv jvf Ki†Z cvi†e|
- †jRv†ii eënvî ,†jv Rvb†Z cvi†e|

cÖ*koevËi

ce©

Aaüq cwiwPwZ

Aaüq - 02

‡jRvi wi‡Rv‡bUi Ges

GbvwR© eÈb

Av#jvP·welq

- wi#Rv#bUi Kx?
- A⁻vqx wi#Rv#bUi Kx?
- #jRvi #MBb Kv#K e#j?
- #jRvi #MBb Gi cÖKvi#f` Kx Kx?

wi†Rv†bUi Kx ?

KüwfwU Øviv m,,ó †jRvi jm†K mgš^q
K†i †jRvi wbqš¿b Kivi cÖwμqv†K
i†Rv†bUi e†j| we†kl †gv†Wi Rb¨jm Kg
Ges AevwÂZ †gv†Wi Rb¨jm †ewk nq|

A⁻'vwq wi≠Rv≠bUi Kx ?

A⁻'vwq wi≠Rv≠bUi Av≠jvK iwK¥
wi≠Rv≠bUi Aÿ n≠Z µgvMZ †ei n≠Z
_v≠K,hZÿb ch©šÍ GKwÎZ †QvU DËj
`c©b m≠i hvq | G wi≠Rv≠bUi n≠Z cÖvß
AvDUcyU weg ejq m`„k AvKv≠ii nq
Ges †QvU Avqbbvi Qvqv Øviv gvSLv≠b
wQ`^a hy³ nq|

$\frac{1}{s} R(s) \frac{1}{s} M(s) K(s) \frac{1}{s} K(s) I(s) K(s)$
 $K(s)?$

$\frac{1}{s} B(s) a(s) \frac{1}{s} R(s) \frac{1}{s} M(s) c(s) I(s) v(s) h(s) q(s)$

1. $m \frac{1}{s} \frac{1}{s} \frac{1}{s} \frac{1}{s} M(s) B(s)$ (Saturated gain)
2. $A m \frac{1}{s} \frac{1}{s} \frac{1}{s} \frac{1}{s} M(s) B(s)$ (Unsaturated gain)

‡jRvi ‡MBb Kq cÖKvi I Kx Kx?

1. $m^{\alpha}u_{,,}^3$ ‡MBb(Saturated gain): $m^{\alpha}u_{,,}^3$

‡MBb‡K ‡QvU wmMbvj ‡MBbI ejv nq
Kvib GB ‡MBb AwZ $\ddot{y}z^a$ BbcyU
wmMbvj ‡y‡ÎI cÖ‡hvR|

2. $Am^{\alpha}u_{,,}^3$ ‡MBb(Unsaturated gain):

$Am^{\alpha}u_{,,}^3$ ‡MB‡b cigvby‡K D‡ËwRZ
Ae⁻vq cv α u Kiv n‡j ‡dvUb wbM©K nq
bv| cigvby GB D‡ËwRZ Ae⁻vq

⁻^Zù~Z© wbtmib Øviv evB‡i ‡ei nq|

wkLbdj

- wi†Rv†bUi m᳚ú†K© aviYv jvf Ki†Z

cvi†e|

- A⁻vqx wi†Rv†bUi Kv†K e†j Zv Rvb†Z

cvi†e|

- †jRvi †MBb m᳚ú†K© aviYv jvf Ki†Z

cvi†e|

- †jRvi †MBb Gi cÖKvi†f` m᳚ú†K©

Rvb†Z cve†i|

cÖ*koevËi

ce©

Aaÿq cwiwPwZ

Aaÿq - 03

‡jRvi eÿÛDBW_

Av†jvP¨welq

- †jRv†ii e¨Û DBW_ Kv†K e†j?
- †jRv†ii e¨Û DBW_ wKfv†e Kgv†bv hvq?
- †jRvi wKfv†e wm†1/2j †gv†W ivLv hvq?

†jRv†ii evÛDBW_ Kx ?

†jRvi evÛ DwqW&_ ej†Z wKQz
wd«Kz†qwÝ ev Zi^{1/2} ‰o`†N©i †i†Äi
we-Ívi†K eySvq|

†jRv‡ii eÿÛDBW_ Kgv‡bvi c×wZ
Kx Kx?

_vg©vj †e^av‡Wbwqs Kwg‡q (KwVb
†jRv‡ii Rb) Ges gvaÿ‡K VvÛvK‡i †jRv‡ii
Bandwidth Kgv‡bv m^αϕe| Avevi Pvc
(Pressure) Kwg‡q Mÿm †jRv‡ii
Bandwidth Kgv‡bv hvq|

$\frac{1}{2} \lambda = 2n \mu t \cos \theta$
 $\lambda = \frac{2n \mu t \cos \theta}{m}$

For a given wavelength λ , the thickness t of the film must be such that $2n \mu t \cos \theta = m \lambda$.
For a given thickness t , the wavelength λ must be such that $2n \mu t \cos \theta = m \lambda$.
For a given thickness t , the angle θ must be such that $2n \mu t \cos \theta = m \lambda$.
For a given thickness t , the refractive index n must be such that $2n \mu t \cos \theta = m \lambda$.
For a given thickness t , the refractive index μ must be such that $2n \mu t \cos \theta = m \lambda$.
For a given thickness t , the refractive index n and the refractive index μ must be such that $2n \mu t \cos \theta = m \lambda$.
For a given thickness t , the refractive index n , the refractive index μ , and the angle θ must be such that $2n \mu t \cos \theta = m \lambda$.
For a given thickness t , the refractive index n , the refractive index μ , the angle θ , and the refractive index m must be such that $2n \mu t \cos \theta = m \lambda$.

wkLbdj

- †jRv†ii eüÛ DBW_ mαú†K© aviYv jvf Kiv|
- †jRv†ii eüÛ DBW_ wKfv†e Kgv†bv hvq Zv Rvb†Z cvi†e|
- †jRvi wKfv†e wm†1/2j †gv†W ivLv hvq Zv Rvb†Z cvi†e|

cÖ*koevËi

ce©

Aaÿq cwiwPwZ

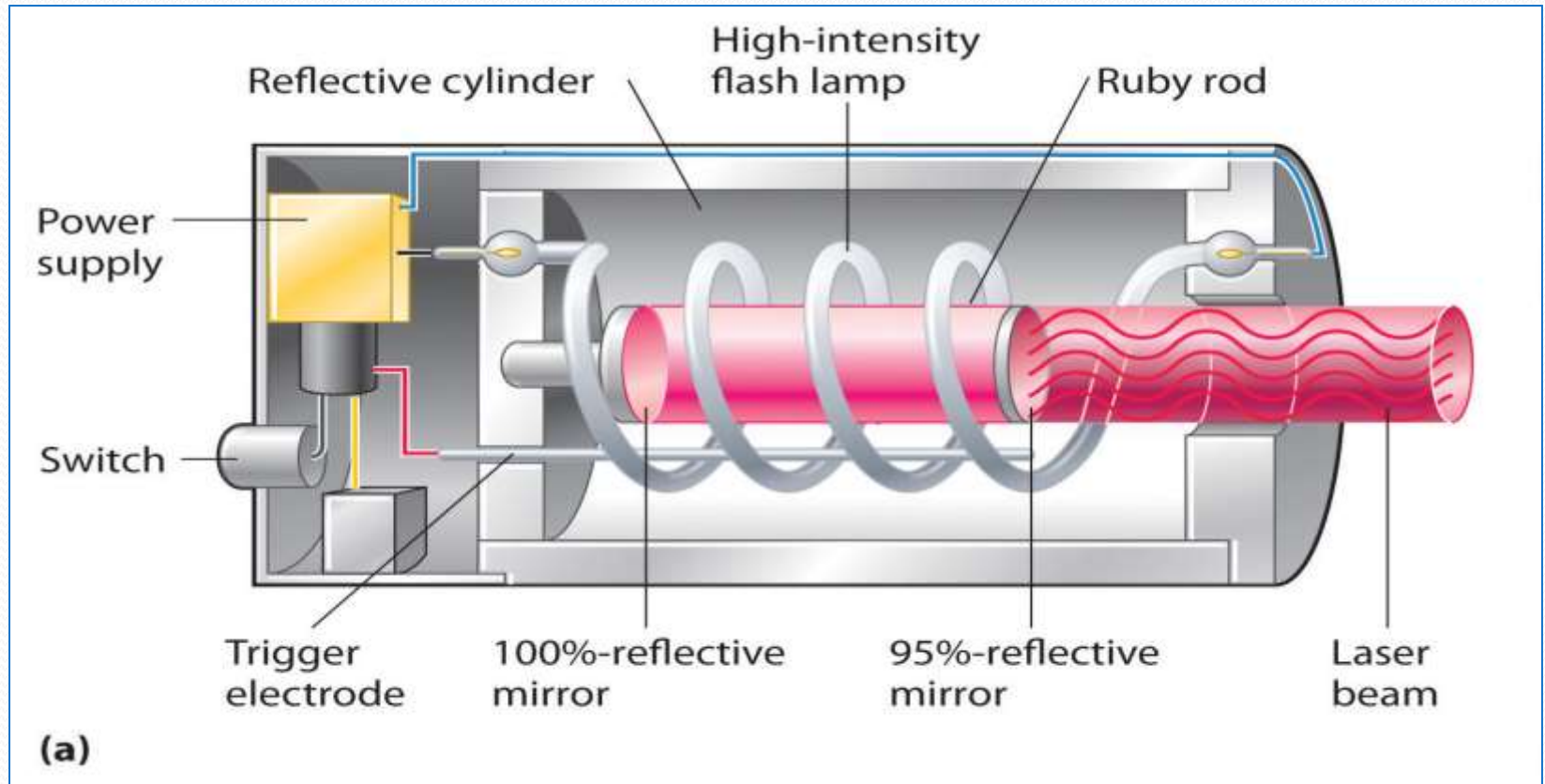
Aaÿq - 04

cvjmW iæwe Ges
wbIWvBwgqvg ‡jRvi

Av†jvP¨welq

- cvjmW iæwe †jRvi wKfv†e KvR K†i ?
- cvjmW iæwe †jRv†ii MVb I Kvh©cÖYvjx eY©bv Ki|
- cvjmW iæwe †jRv†ii eënvî †jL|
- Nd-YAG †jRvi wKfv†e KvR K†i ?
- Nd-YAG †jRv†ii MVb I Kvh©cÖYvjx eY©bv Ki|
- Nd-YAG †jRv†ii eënvî I cÖ†qvM †jL|
- wPwK rmv †j†Î wewfboe ai†bi †jRv†ii eënvî †jL|

cvjmW iæwe †jRv†ii MVb



wPÎ: cvjmW iæwe †jRv†ii †⁻†gwUK
WvqvMÖvg|

cvjmW iæwe †jRv†ii MVb

cvjmW iæwe †jRv†ii MVb KvcvwmUi
eÿsK I cvjm Drcv`bKvix BbWvK†UÝ Gi
mv†_ D" P wef†ei U^avÝdigvi (4000-
10,000 v) ms†hvM Kiv nq| G
†bUIqv†K©i mv†_ †mvRv ev †nwjKb Gi
gZ †Sbb d¬vk jv†ú ms†hvM Kiv nq|
iæwe wµ÷vj d¬vk jv†úⁱ mvnv†h
cvw†ú^s Kiv nq hv†K Ggbfv†e myeë´v
Kivnq hv†Z wµ÷v†j Av†jv †dvKvwms Kiv
hvq|

cvjmW iæwe †jRv†ii MVb



wPÎ: cvjmW iæwe †jRvi h†šçi ev-Íe iæc|

cvjmW iæwe †jRv†ii eënyi I
cÖ†qvM

†iwUbv †Kv†q,†jkb Kivi Rb¨cvjmWiæwe
†jRvi GKwU Av`k© GbvWR© Drm, Kvib
Gi Zi½%o`N©¨ †iwUbv I †Kvq†iW G
†kvlb Ki†Z cv†i| †Kvb e_v I
G†bm†_wmqv Qvov `yB-GK wgwb†Ui
g†a`†iwUbv wew"Qbœ Kiv mα†e|

Nd-YAG ত্বর্নবিদ্বি MVB

evwYwRK fv#e eëüZ Nd-YAG ত্বর্নবি cvIqvi
mvcøvB Ges ত্বর্নবি †nW wb#q MwVZ, hv#K jvBU
MvBW I †dvKvwms nÛw#c#Pi mv#_ emv#bv nq|
m#ú~Y© wm#÷#g 380v, 20 A I 3phase
mvwK©#Ui mvnv#h Acv#iU Kiv nq, hv#Z G
ত্বর্নবি#K A#Uv#gwUKmyBwPs Ges gwBUwis Kiv
m#e| nvB cvIqv#ii Rb#ú wdwUsm Ges YAG^a
wμ÷vj#K wm#1/2j mvwK©U Kzwjs wm#÷#gi
gva#g VvÛv ivLv nqGesGUv hv#Z wbivc` Ae⁻vq
_v#K †mRb#d-v gwBUi Ges gvM#bwUK fvj&e

Nd-YAG †jRv‡ii MVb

Kzwjswm‡÷‡gi Rb¨ cÖvq cÖwZ wgwb‡U 10
wjUvi cvwb 3.5 I‡qevi Pv‡c cÖ‡qvM Kiv
nqGes G BbcyU cÖvq 70 Iqv‡Ui jvBU MvBW
m‡úboe AvDUcyU cvIqv hvq| AvaywbK
wPwKrmv cÖhyw³i Pwvñ`v wgUv‡Z GKwU
jvBUMvBW LyeB cÖ‡qvRb hv‡Z eo ai‡bi jm
Qvov †jRvi GbvWR© U^avÝwgU Kiv hvq|
GQvov wewfbœ wdì †hgb- Gb‡WvmKwc,
BD‡ivjwR, wbD‡ivmvR©vwi, B.Gb.wU,
MvB‡bvKiwR. Wvvi‡avUiwR. †W>UvimvR©vwi

Nd-YAG ত্বরণের MVB



উপস্থাপিত: Nd-YAG ত্বরণের হস্তচালিত যন্ত্র

Nd-YAG †jRv‡ii eënvî I

cÖ‡qvM

- †jRvi B>Uvi‡÷wkqvj d‡Uv-‡Kvqv,‡jkb Kivi Rbëënvî Kiv nq|
- gv_vq, Ku‡a, wjfv‡i, †e^a‡÷ Ges AMœvk‡q mwjW wUmy^ˆaÿsm Kivi Kv‡R Gi cÖ‡qvM cwijwÿZ nq|
- †_ivcwUK Ges †ivM wbY©q †ÿ‡Î |
- Ac_vj‡gvwR-‡Z Nd-YAG †jRvi eënvî Kiv nq|

wPwKrmv †ÿ#Î wewfbœ ai#bi †jRv#ii eënyi

- Ac_vj#gvjwR (Ophthalmology)t AvM©b †jRvi, iæwe †jRvi, wµPb †jRvi|
- Wvigv#UvjwR (Dermatology)t AvM©b †jRvi, iæwe †jRvi, Kve©b WvB-A.vBW †jRvi, Nd-YAG †jRvi|
- MvBwb#KvjwR (Gynecology)t AvM©b †jRvi, Kve©b WvB- A.vBW †jRvi, Nd-YAG †jRvi|
- Mïm#U&^avGbUv#ivjwR (Gastroenterology)t AvM©b Avqb †jRvi (Argon Ion Laser)
- mvR©vwi (Surgery)t G.vBgvi (Excimer) †jRvi †hg bÑ Arf, Krf, Xecl, XeF
- #WbwUw÷^a (Dentistry)t G.vBgvi †jRvi|

wkLbdj

- cvjmW iæwe †jRvi wKfv#e KvR K#i †m m#ú#K© aviYv jvf Ki#Z cvi#e|
- cvjmW iæwe †jRv#ii MVb m#ú#K© aviYv jvf Ki#Z cvi#e|
- cvjmW iæwe †jRv#ii eënyi I cÖ#qvM Rvb#Z cvi#e|
- Nd-YAG †jRvi wKfv#e KvR K#i †m m#ú#K© aviYv jvf Ki#Z cvi#e|
- Nd-YAG †jRv#ii MVb m#ú#K© aviYv jvf Ki#Z cvi#e|
- Nd-YAG †jRv#ii eënyi I cÖ#qvM Rvb#Z cvi#e|
- wPwK rmv †j#Î wewfbœ ai#bi †jRv#ii eënyi Rvb#Z cvi#e|

cÖ*koevËi

ce©

Aaüq cwiwPwZ

Aaüq - 05

wnwjqvg-wbqb ‡jRvi

Av†jvP¨welq

- Mvm †jRvi U^avbwRkb Kx?
- †jRvi G·vB†Ukb Kx?
- wnwjqvg wbqb †jRvi wKfv†e KvR K†i ?
- wnwjqvg wbqb †jRv†ii MVb I Kvh©cÖYvjx
eY©bv Ki|
- wnwjqvg wbqb †jRv†ii eënvi I cÖ†qvM †jL|

Mvm †jRvi U^avbwRkb

Mvm †jRvi U^avbwRkb nj g~jZ GbvwR©
†j†fj U^avbwRkb, A_©vr GbvwR© †j†f†ji
cwieZ©†bi gva†g †jRvi Av†jv Drcboe K†i|

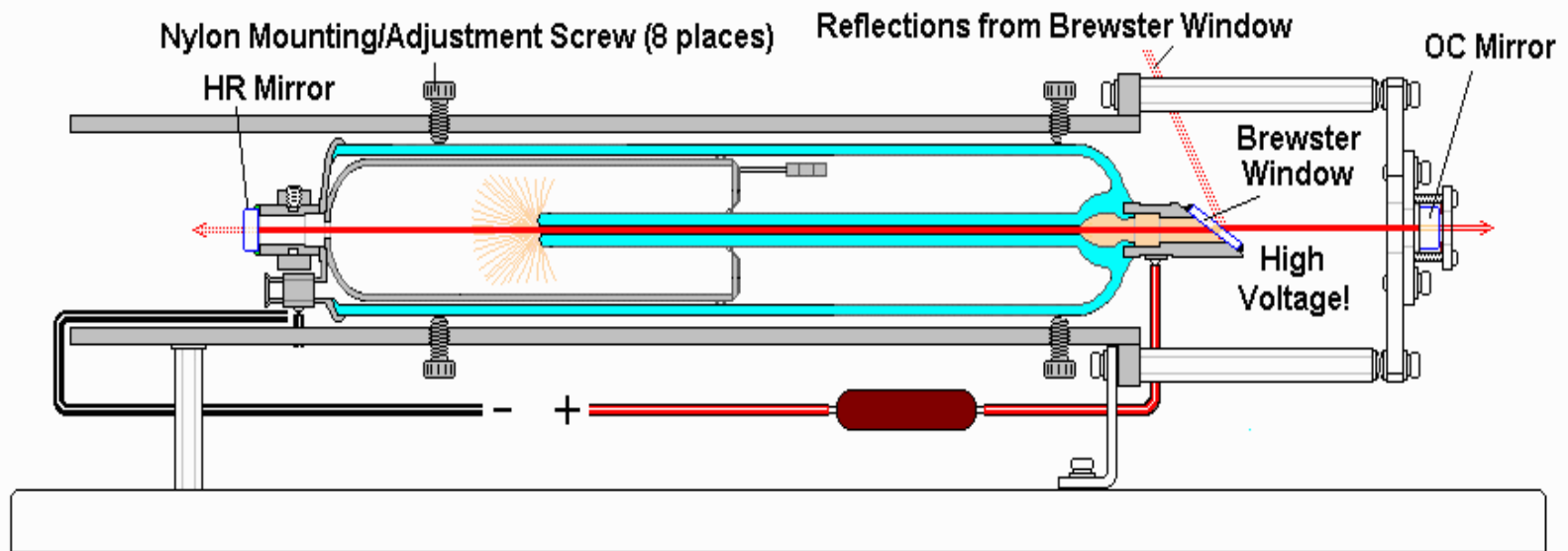
‡jRvi G·vB‡Ukb Kx?

mKj evwbwRĶ B‡jKU^awbK U^avbwRkb
Mÿm †jRvi, ê`ÿwZKfv‡e D‡ËwRZ Kiv
nq|G‡ÿ‡G cvIqvi mvcøvB Kgvwk©qvj
MÖxW Kv‡i>U‡K D" PZi ‡fv‡ëR wWwm
Kv‡i‡>U iæcvšÍwiZ K‡i|

wnwjqvgÑwbqb †jRvi Kx?

wbqb Mv†mi cigvby†K Ab¨wnwjqvg Mv†mi
cigvbyi mv†_ msN†l©i gva†g cvwαús K†i th
†jRvi cvIqvi hvq Zv†K wnwjqvg wbqb †jRvi
e†j| G†y†G AvKwUf wgwWqvg wn†m†e
Mvmxq c`v_© eënyi Kiv nq|

wnwjqvg-wbqb †jRv‡ii MV/h



Anode-End One-Brewster HeNe Laser Tube Mounted in Test Fixture

wPÎt wnwjqvg wbqb †jRv‡ii †‡‡gwUK
WvqvMÖvg|

wnwjqvg wbqb †jRv‡ii

MVb

wnwjqvg wbqb †jRvi Źwi‡Z GKwU
wWmPvR© wUDe eënyi Kiv nq,hv‡Z 10
fvM wnwjqvg I 1 fvM wbqb _v‡K|
Kw>UwbDqvm †jRvi we‡gi Rb¨ ‡iwWI
wd«Kz‡qwÝ G·vB‡Ukb Øviv
Mïm‡K ê`yüwZKfv‡e wWmPvR© K‡i cvwαús
wμqv mαúbœ Kiv nq|

wnwjqvg-wbqb †jRv‡ii

MVb

wn&wjqv‡gi `ywU B‡jKU^ab mgvšÍivj I AmgvšÍivj G
`yÕfv‡e Nyi‡Z cv‡i| c~ev©e⁻vq Giv GKwU
Gbvwr© †j‡e‡j _v‡K, hv MÖvDÛ †j‡e‡ji †P‡q A‡bK
Dc‡i| †gUv‡÷ej †j‡e‡ji wKQz B‡jKU^ab Avb-G·vB‡UU
wnwjqvg Mv‡mi gZ AvPib K‡i| †gUv‡÷ej †j‡e‡ji
wnwjqvg cigvby Ges Avb-G·vB‡UU wbqb cigvbyi
g‡a` msN‡l©i gv‡a‡g Gbvwr© wbq‡b `vbšÍwiZ
nq, hv‡Z G·vB‡UU †j‡e‡j wbqb cigvbyi msLÿ e,,w×
cvq| hLb GB cigvby,jy MÖvDÛ †j‡e‡j wd‡i hvq ZLb
G‡`i g‡a`wKQz cigvby AcwUKÿj wiwRI‡b AvDUcyU

wnmv‡e cvIqv hvq| GUv c^awZwbqZ Acv‡iU Kiv
m‡e wKÿ AvDUcyU wnmv‡e cvIqv m‡e wKÿ by

wnwjqvg-wbqb †jRv‡ii



wPÎt wnwjqvg wbqb †jRvi h‡šçi evÎe iæc |

wnwjqvgÑwbqb †jRv‡ii
cÖ‡qvM

wnwjqvgÑwbqb †jRvi K>U^av± mvR©vwi‡Z
eëenvi Kiv nq, ¯<v̄wbs †jRvi Ac_vj‡gv‡¯<vc G
†iwUbvj AvB U^avKvi Ges †_ivwcDwUK
wWfvBm wn‡m‡e eëenvi Kiv nq|

wkLbdj

- Mvm †jRvi U^a vbwRkb m^αú[†]K© aviYv jvf Ki[†]Z cvi[†]e|
- †jRvi G·vB[†]Ukb m^αú[†]K© aviYv jvf Ki[†]Z cvi[†]e|
- wnwjqvg wbqb †jRvi wKfv[†]e KvR K[†]i †m m^αú[†]K© aviYv jvf Ki[†]Z cvi[†]e|
- wnwjqvg wbqb †jRv[†]ii MVb I Kv^h©cÖYvjx Rvb[†]Z cvi[†]e|
- wnwjqvg wbqb †jRv[†]ii e^{en}vi I cÖ[†]qvM Rvb[†]Z cvi[†]e|

cÖ*koevËi

ce©

Aaüq cwiwPwZ

Aaüq - 06

AvM©b ‡jRvi

Av‡jvP¨welq

- AvM©b †jRvi Kx?
- AvM©b †jRv‡ii eøK WvqvMÖvg I
Kvh©bxwZ eY©bv Ki|
- AvM©b †jRvi Gi cÖ‡qvM †jL|
- AvM©b †jRvi Gi Amyweav †jL|
- dvBevi AcwUK M¨w÷^aK d‡Uv-‡Kvqv,‡jkb
Gi eøK WvqvMÖvg AsKY Ki|

AvM©b †jRvi Kx?

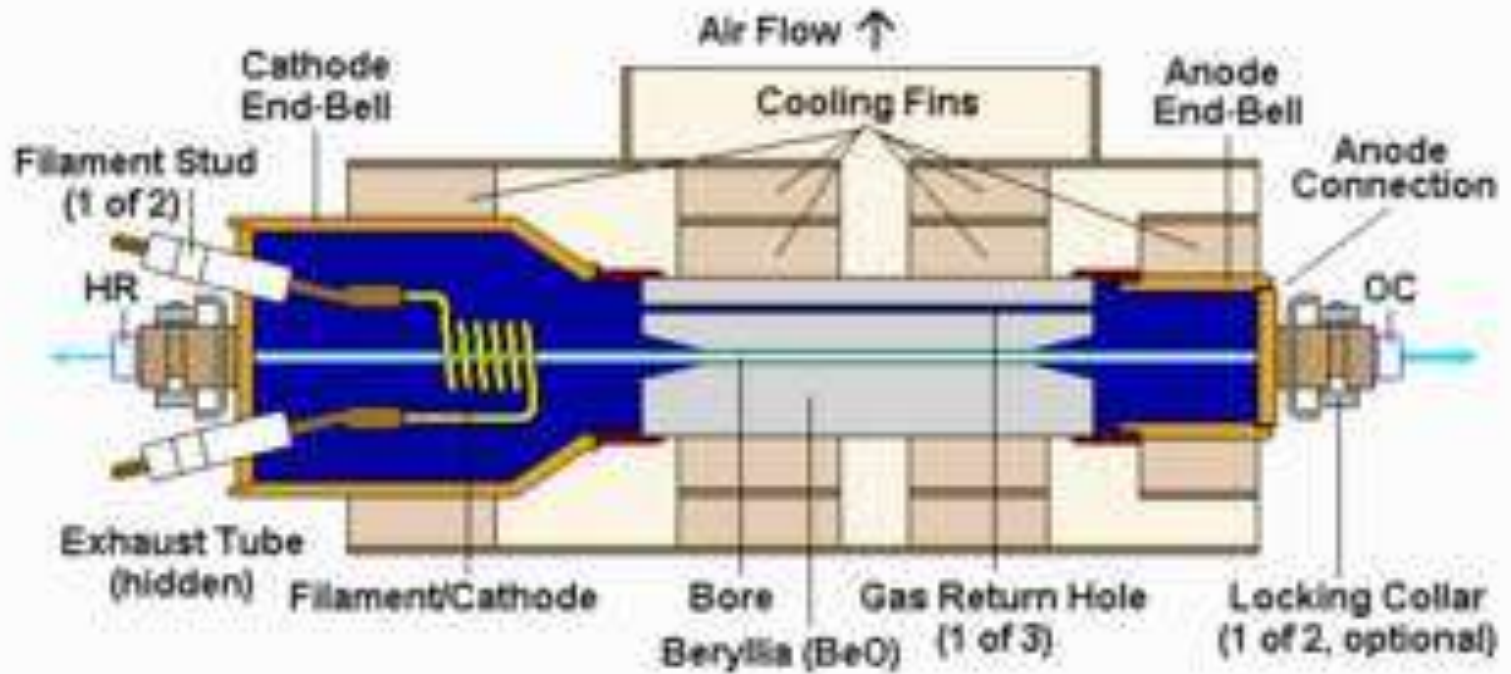
cøvRgv wUDe gaŵ'Z AvM©b Mv†m
D"Pgv†bi Kv†i>U cÖevwnZ Ki†j Mv†m
AvqwbZ nq Ges GK ch©vq AvM©b cigvby
nvB Gbvwr© †j†f†j Avmvi gva†g Av†jv
wbM©Z nq, G†K AvM©b †jRvi e†j|

AvM©b †jRv‡ii eøK

AvM©b †jRvi Drcv`‡bi g~j Ask n‡jv cøvRgv wUDe| Lye
D" Pgv‡bi Kv‡i>U AvM©b Mv‡mi ga` w`‡q wUDe

K‡>Ubbv‡i cÖ‡ek Kiv‡bv nq| G‡Z AvM©b Mvm AvqwbZ
nq Ges Avqb,‡jv G·vB‡UW Ae`v‡b _v‡K| GKwU kw³kvjx
B‡jKwU^aKvj Kv‡i>U wUD‡ei ga` w`‡q AvM©b Mvm‡K
cÖev‡ni Rb`ej cÖ‡qvM K‡i Ges wUD‡ei cÖv‡šÍ Avqbv
_v‡K| G Kv‡i‡>Ui gva‡g AvM©b cigvby D"P GbvWR©
†j‡†j AR©b K‡I Ges Av‡jv wbM©gb iiæ nq| Avqbv _vKvi
Kvi‡b Av‡jv cÖwZdwjZ nq Ges AwZwi³ AvM©b cigvby
wbœœ GbvWR,, †j‡†j h&q& G Avqbv _vKvi Kvi‡b jvB‡bi
wKQz Ask weg wn‡m‡e cvIqv hvq| †h‡nZz AvM©b
Mvm‡K AvqwbZ Kivi Rb` D"P NbZ; mœúbœ Kv‡i‡>Ui
cÖ‡qvRb nq, ZvB GB KvR mœúbœ Ki‡Z cwIqvi
KbRvœúkb nq Ges G‡K Kzwjs Kivi eëmv_v Kivi cÖ‡qvRb
nq|

AvM©b †jRv‡ii eøK WvqvMÖvg I Kvh©bxwZ



Structure of Typical Cynonics/Uniphase Argon Ion Laser Tube

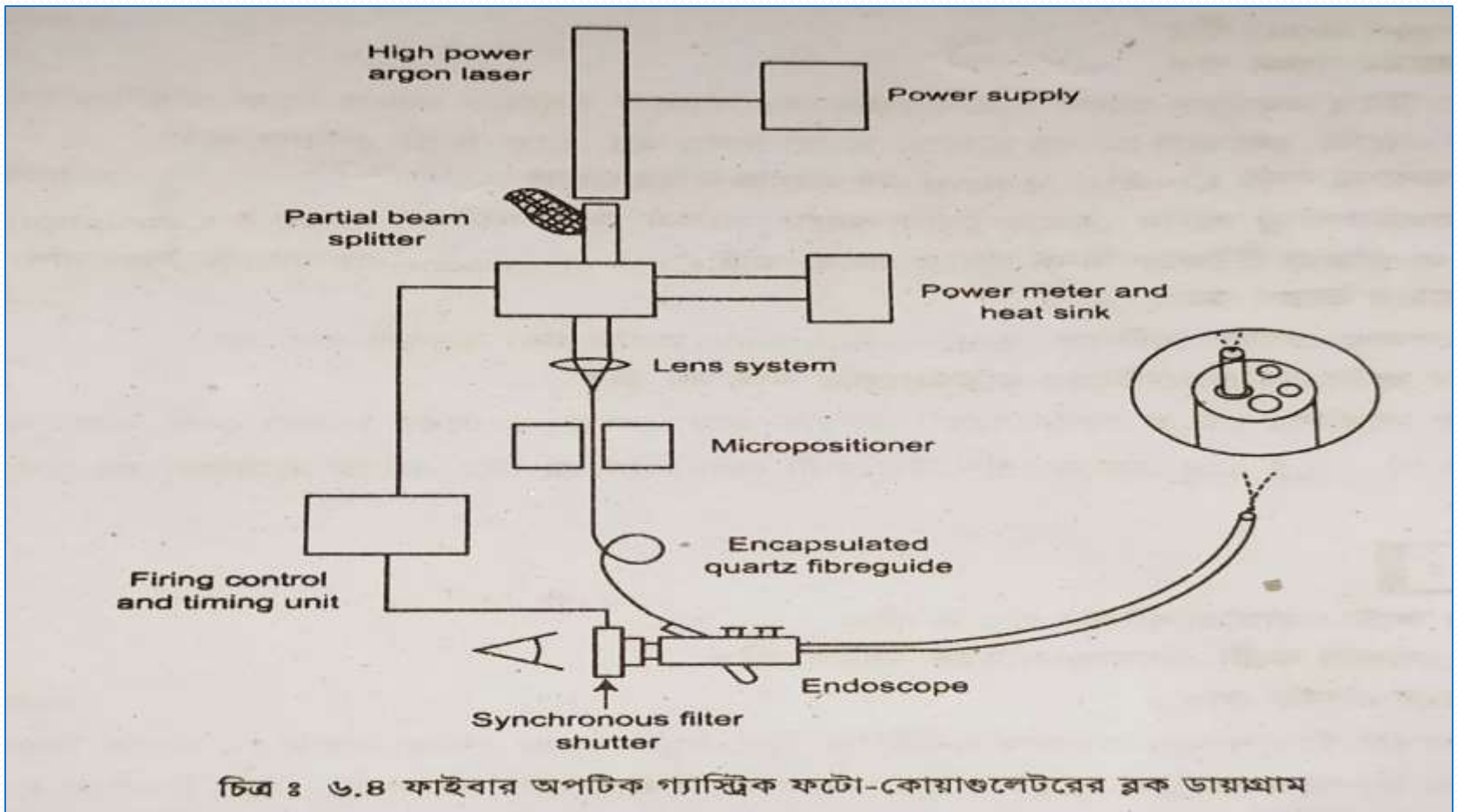
AvM©b †jRvi Gi cÖ‡qvM

AvM©b †jRvi †iwUbvq d‡Uv †Kvqv,‡jkb Kivi
†j‡Î Dc‡hvMx| Kvib Abvb †jRvi mg~n eøvW
†f‡mj Øviv cy‡ivcywifv‡e †kvwlZ nq bv| G
Qvov K‡ivwbK †gwWwm‡bI AvM©b †jRvi
eëüZ nq|

AvM©b †jRvi Gi Amyweav

AvM©b †jRvi Drcv`‡bi mgq D"P NbZ;
mꞑúboe Kv‡i‡>Ui cÖ‡qvRb nq, hv cÖPÛ Zvc
m,,wói gva‡g wUD‡ei Kÿ‡_vW Ask‡K aÿsm
K‡i| GUv wUD‡ei Avqy®<vj mxwgZ K‡I Ges
GKUv wbw`©ó mgq AšÍi wUDe cÖwZ`vc‡bi
cÖ‡qvRb nq, hv AZšÍ eëeûj|

dvBevi AcwUK Mv̄w ÷^aK d#Uv-#Kvqv, #jkb Gi
eøK WvqvMÖvg



wkLbdj

- AvM©b †jRvi Kx mᵂú†K© aviYv jvf Ki†Z cvi†e|

- AvM©b †jRv†ii eøK WvqvMÖvg I Kvh©bxwZ mᵂú†K© aviYv jvf Ki†Z cvi†e|

- AvM©b †jRvi Gi cÖ†qvM mᵂú†K© aviYv jvf Ki†Z cvi†e|

- AvM©b †jRvi Gi Amyweav mᵂú†K© aviYv jvf Ki†Z cvi†e|

- dvBevi AcwUK Mvw ÷^aK d†Uv-†Kvqv,†jkb Gi eøK WvqvMÖvg mᵂú†K© Rvb†Z cvi†e|

cÖ*koevËi

ce©

Aaüq cwiwPwZ

Aaüq - 07

Kve©b WvB-A.vBW ‡jRvi

Av†jvP¨welq

- Kve©b WvB-A·vBW †jRvi Kv†K e†j ?
- Kve©b WvB-A·vBW †jRv†ii MVb / Kve©b WvB-A·vBW (CO₂)- †jRvi wm†÷†g 450-Gi Kvh©c×wZi eY©bv Ki|
- Kve©b WvB-A·vBW †jRv†ii eënvI cÖ†qvM †jL|
- CO₂ †jRv†ii mxgve×Zv †jL|

Kve©b WvB-A·vBW (CO₂)

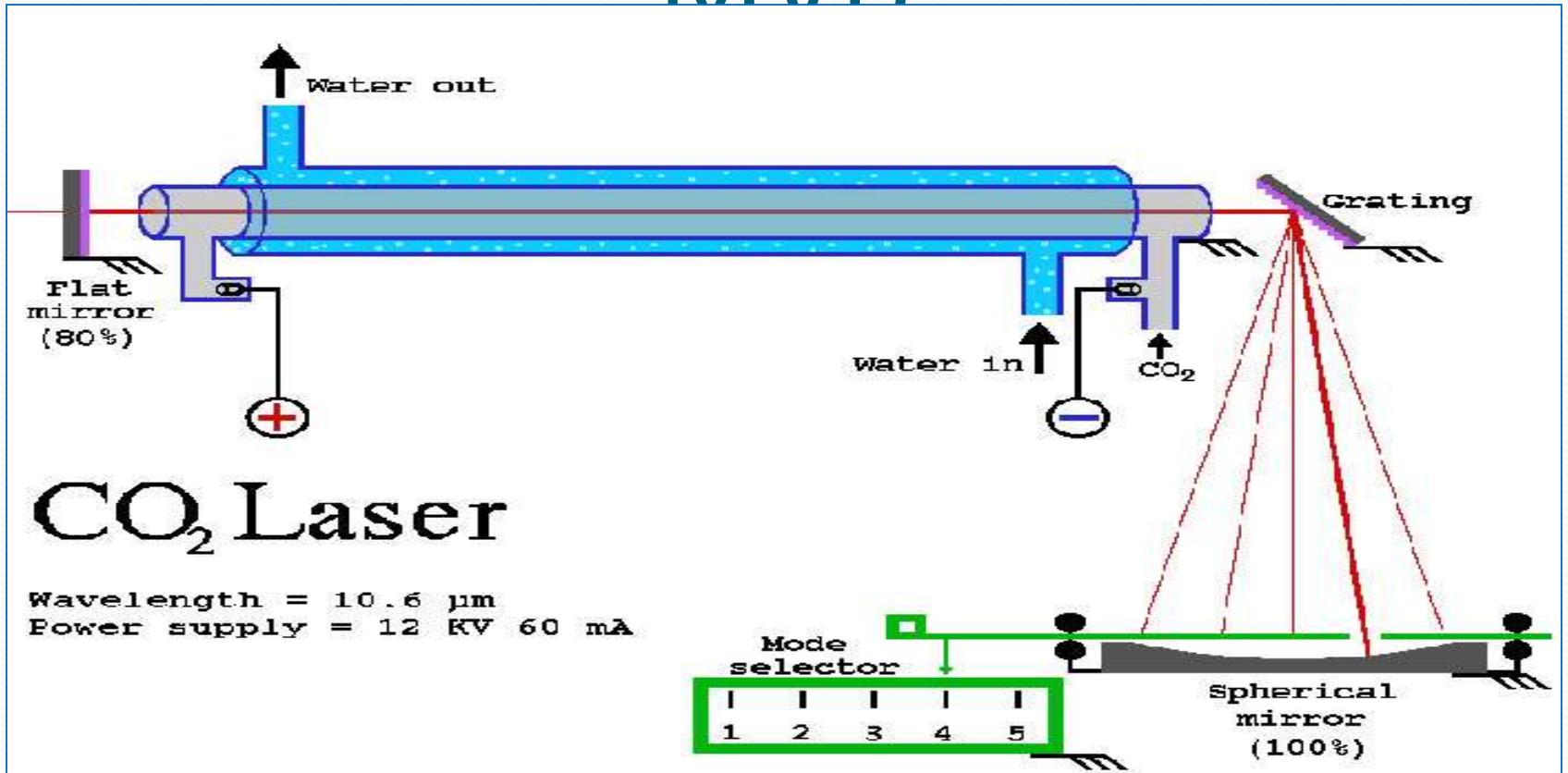
~~Kve©b WvB-A·vBW (CO₂) †jRvi nj Kve©b
WvB-A·vBW (CO₂) bvB†U^av†Rb (N₂) Ges
wnwjqvg (He) Mv†mi wwkÖb| †hLv†b Äw±f
GbvR© BwgvUs Mvm wn†m†e Kve©b
WvB-A·vBW (CO₂) †K eënvi Kiv nq| GwU
mvaviYZ gvwë†gv†W KvR K†i| Gi mv†n†h³cvZ
wenxb mvR©vwi Kiv m††e|~~

Kve©b WvB-A·vBW

‡jRv‡ii MVb

Kve©b WvB-A·vBW ‡jRvi gvwë †gv‡W
Acv‡iU Kiv nq| †iR‡bU‡ii ga¨ w`‡q
A¨byjvi Wvqv«vg cÖ‡ek Kivi gva‡g
wm‡1/2j †gvW AvDUcyU cvIqv hvq
wRm †dvKvj ´úU 0.5 wg wg ch©šÍ
Kgv‡bv m^αϕe| Acv‡iwUs gvB‡μv‡⁻<vc
‡jRv‡ii mv‡_ hy³ Kiv nq hv‡Z wPwKrmvi
mgq wUmy¨fvjfvte †`Lv hvq|

Kve©b WvB-A.vBW †jRv†ii MV/h



wPÎt Kve©b WvB-A.vBW (CO₂) †jRv†ii †~<†gwUK
WvqvMÖvg|

Kve©b WvB-A·vBW †jRv†ii MVb

CO2 †jRv†ii Kbfvk©b Gwdwm†qwÝ LyeB
†ewk, hv iæwe †jRv†ii †P†q 15% †ewk, †hLv†b
iæwe †jRv†ii nj 1-2%| G†Z Kzwjs wm†÷g
wn†m†e †U†ci cvwb eënyi Kiv nq `v†g Lye
m-Ív| †jRvi weg†K Dchy³ Avqbv I †j†Ýi gva†g
†dvKvm ev cÖwZdwjZ K†i Gici mvwR©Kvj
güwbcyy†jUi Gi ga`w`†q cÖ†ek Kiv†bv nq| G
†jRvi wPwKrmv `v†b GKwU cvZjv -Íi m,,wó
K†i, hv Ab`wUmy†K -úk© Ki†Z evav cÖ`vb
K†il

Kve©b WvB-A.vBW †jRv†ii

MV/b



wPÎ: Kve©b WvB-A.vBW (CO2) †jRvi h†šzi
evÍe iæc

Kve©b WvB-A·vBW eënyi I cÖ‡qvM

Kve©b WvB-A·vBW (CO2) ‡jRvi wn‡m‡e
eënyi Kiv nq| Gme As‡ki mvwR©Kvj
Aüwcø‡Kkb bündwvswis, U^avwkqv-e^aswKIj
U^ax, bvK, Iivj KüwfwU, wewfbœ tiv‡Mi
mvwR©Kvj Bb÷^ay‡g>U wn‡m‡e AwakZi
eënyi Kiv nq| Kve©b WvB-A·vBW (CO2) ‡jRvi
kix‡ii wewfbœ As‡ki KüÝvi ‡hgb jüwis,
düwis· BZüw`‡Z c^av_wgK wPwKrmv wn‡m‡e
eënyi w`b w`b te‡oB Pj‡Q|

Kve©b WvB-A·vBW †jRv‡ii
mxgve×Zv

Kve©b WvB-A·vBW (CO₂) †jRv‡i †j‡Î
Acv‡ikb -'vb AekB ié n‡Z n‡e| eøvW,
†mwie^avj -úvBivj d¬zBW, mÿwjfv BZÿw`
Dcw- 'wZ‡Z wUmy`KvUv KwVb n‡q c‡o|
ÿZ- 'vb hv‡Z memgq a~gcvb I
Rjxqev®ú gy³ ivL‡Z nq|

wkLbdj

- Kve©b WvB-A·vBW †jRvi mαú†K© aviYv jvf Ki†Z cvi†e|
- Kve©b WvB-A·vBW †jRv†ii MVb / Kve©b WvB-A·vBW (CO₂)- †jRvi wm†÷†g 450-Gi Kvh©c×wZi eY©bv mαú†K© Rvb†Z cvi†e|
- Kve©b WvB-A·vBW †jRv†ii eënyi I cÖ†qvM Rvb†Z cvi†e|
- CO₂ †jRv†ii mxgve×Zv Rvb†Z cvi†e|

cÖ*koevËi

ce©

Aaÿq cwiwPwZ

Aaÿq - 08

G·vBgvi ‡jRvi

Av†jvP¨welq

- G·vBgvi AYy Kx ?
- G·vBgvi †jRvi Kv†K e†j ?
- G·vBgvi †jRvi†K Kxfv†e cvwαús Kiv nq ?
- G·vBgvi †jRv†ii eënvI cÖ†qvM †jL|

G·vBgv i †jRvi Kx?

G·vBgv i †jRvi nj GKwU Avë^avfv†qv†jU
†jRvi hv wewfbœ ai†bi gvB†μv
B†jKU^awbK wWfvBm †hgb –
Bw>U^a†MÖ†UW mvwK©U ev
wPc&m Žwi†Z eënv i nq|

G·vBgvI AYy Kx?

G·vBgvI Aby G·vB#UU Ae'vq 'vqx AYy
wn#m#e weivR K#i| hw` GKwU G·vBgvI
Aby Gi GbvWR© nvivq Zvn#j fzwg-Í#i
wd#i Av#m Ges K#qK wc#Kv#m#K#Ûi g#a·
Aby †f#1/2 - ^Zš;fv#e cvigvby Avjv`v n#q
hvq|

#hgb t wµPb †d¬vivBW (KrF) GKwU

G·vBgvI AYy|

G·vBgv i †jRv†ii cvwαús

wuqv

G·vBgv i †jRvi cÖwZwbqZ cvwαús Kiv
hvq bv| G†Z we`yř cÖ†qvRb nq| G,†jv
ccy†jkb Bbfvk©b m,,wó K†i cvjm&
AvKv†i wbM©Z nq Kvib ccy†jkb
Bbfvk©b AZšÍ eo n†Z n†e Ges mv†_
mv†_ wWmPvR© cvwαús Lye †ewk n†Z
n†e| ê`yüwZK mwwK©U CW wWmPvR©
cvwαús †jRv†ii Rb·KvR K†i|

G·vBgvi †jRv‡ii eënvı I cÖ‡qvM

G·vBgvi †jRvi mvavibZ ivmvqwbK I
Rxewe`vq M‡elbvi I Dbœeq‡b c`v_©
cÖwµqvKi‡bi Ges wPwKrmv weÁv‡b
eënvı Kiv nq|

wkLbdj

- G·vBgvi AYy m^αú[‡]K© aviYv jvf Ki[‡]Z cvi[‡]e|
- G·vBgvi †jRvi m^αú[‡]K© aviYv jvf Ki[‡]Z cvi[‡]e|
- G·vBgvi †jRvi[‡]K Kxfv[‡]e cvw^αús Kiv nq Zv Rvb[‡]Z cvi[‡]e|
- G·vBgvi †jRv[‡]ii eënvI cÖ[‡]qvM Rvb[‡]Z cvi[‡]e|

cÖ*koevËi

ce©

Aaÿq cwiwPwZ

Aaÿq - 09

‡jRvi †_ivwc Ges †jRvi
cÖ‡qvM

Av‡jvP̄welq

- ‡jRvi †_ivwc Kx?
- d‡Uv †_ivwc Kx?
- ‡jRvi mvR©vwi Kx?
- ‡jRvi †Ww>Uw÷^a Kx?
- ‡jRvi †Ww>Uw÷^ai myweav,‡jv Kx Kx?
- ‡jRvi GbwRIcøvw÷ Kx?

#jRvi †_ivwc Kx?

#h cÖwμqvq wPwKrmv -'v#bi wUmj#K
†jRv#ii gva#g ev®úvwqZ K#I A_ev †K#U
Avjv`v Kiv nq, Zv#K †jRvi †_ivwc e#j|

d≠Uv †_ivwc Kx?

Av≠jvK iwk¥ I Zi^{1/2}%o`N©≠K wbqš; b K≠i
†h †_ivwc †`qv nq Zv≠K d≠Uv †_ivwc e≠j|

†jRvi mvR©vwi

Kx?

†jRvi weg eënvi K†I kix†ii wUmÿ KvUvi
c×wZ†K †jRvi mvR©vwi e†j| †jRvi
mvR©vwii Rb¨ mvaviYZ dvjmW iæwe
†jRvi, Nd-YAG †jRvi, AvM©b †jRvi,
Kve©b WvB-A·vBW †jRvi I wnwjqvg-
wbqb †jRvi eënvi Kiv nq|

†jRvi †Ww>Uw ÷^a

Kx?

†h †UK†bvjwRi gva†g †jRvi eënyi K†I
`uv†Zi wewfbœ wPwKrmv †mev cÖ`vb
Kiv nq, Zv†K †jRvi †Ww>Uw ÷^a e†j|

†jRvi †Ww>U^aw÷I myweav Kx Kx?

- G‡Z †Kvb Aÿ‡b‡'wkqvi `iKvi c‡o bv|
- G‡Z weøwWs Kg nq|
- G‡Z eÿK‡Uwiqvj Bb‡dKkb Lye Kg nq|
- G‡Z Lye ZvovZvwo wUmÿ wiKfvi nq|
- Pvicv‡k wUmÿ aÿsm nIqvi m‡çvebv
Kg _v‡K|

#jRvi GbwRIcøvw÷ Kx?

ü`#ivMx#`i †hme agbx eøK n#q hvq
†m, #jv#K †jRvi eënyi K#i A#cb Kivi
c×wZ#K †jRvi GbwRIcøvw÷ ejv nq|
_vg©vj mgmvi Kvi#b Gi MÖnb#hvMZv
GLb cvIqv hv#"Q bv|

wkLbdj

- †jRvi †_ivwc Kx Zv Rvb†Z cvi†e|
- d†Uv †_ivwc Kx Zv Rvb†Z cvi†e|
- †jRvi mvR©vwi Kx Zv Rvb†Z cvi†e|
- †jRvi †Ww>Uw÷^a Kx Zv Rvb†Z cvi†e|
- †jRvi †Ww>Uw÷^ai myweav,†jv Kx Kx Zv Rvb†Z cvi†e|
- †jRvi GbwRIcøvw÷ Kx Zv Rvb†Z cvi†e|

cÖ*koevËi

ce©

Aaÿq cwiwPwZ

Aaÿq - 10

†gwWKÿj †jRvi †mdwU

Av#jvP'welq

- wewKiY Kv#K e#j ?
- UV – Radiation Kx ?
- wewKi#bi d#j Rxe#`#ni Kx ai#bi ywZ n#Z cv#I ?
- Rx#ei Dci wewKi#bi cÖfve Kx Kx?
- gvbve#`#ni Zi#Ki Dci bb-AvqbvBwRs wewKi#bi cÖfve #jL|
- AwZ#e,wb iwk#i cÖfv#e †Pv#Li Kx ai#bi ywZ n#Z cv#I ?
- wewKib †_#K cÖwZiyv Dcvq †jL|
- #jRvi †mdwU Kx ?
- #jRvi †mdwU Gi b#k#vj ÷vÛvW© Av#jvPbv Ki|

wewKiY Kv#K e#j?

wKQy wKQy †gŠ#ji wbDwK→qvm n#Z
KZ, #jv kw³kvjx A` „k`iwk¥ wewKwiZ nq Ges
†gŠj, #jv †f#1/2 Ab`†gŠ#j cwibZ nq| †gŠ#ji G
fv^{1/2}b cÖwμqv#K †ZRw`ÆqZv e#j Ges
iwk¥ wbM©Z nIqvi cÖwμqv#K wewKiY
e#j|

†kvw|Z †Wv#Ri ††#Î wewKi#bi GKK - †MÖ,
i#vW| G.#cvRv#ii ††#Î wewKi#bi GKK iÄb|

UV – Radiation

UV – Radiation Gi evsjv AvwfavwbK
A_© ÒAwZ‡e,wb iwk‡i wewKibÓ
cÖvK...wZK I K...wÎg Drm mg~n Øviv
wbM©Z nIqv iwk‡, AZš— DËß e⁻i Aš—
f~³ †hgb- m~h© I Av‡qvbvBRW Mÿm
mn 290 †_‡K Ges 400 wg wg Gi gv‡S
I‡qf †jś' †_‡K GB wewKib D™‡~Z nq|

wewKi#bi d#j Rxe#`#ni Kx ai#bi ywZ
n#Z cv#i

- i³ KwbKv aÿsm n#q †h#Z cv#i |
- †`#ni KvVv#gv webó n#Z cv#i|
- mœvqy#Kv#li mgmÿ #`Lv w`#Z cv#i|
- KÿÝvi nIqvi SzwK _vK#Z cv#i|
- wjDwKwgqv †ivM n#Z cv#i|
- cÖRbb cÖwµqvi Dci cÖfve co#Z cv#i|

gvbe#`#ni Zi#Ki Dci bb-AvqbvBwRs wewKi#bi cÖfve

m~h©v#jv#Ki Avë^avv#qv#jU iwk¥ Zi#Ki
Dci co#j `ye©j wUmy;#jv AvμvšÍ nq d#j
wewKwiZ m~#h©i iwk¥ Zvc kw³#Z
ifcvšÍwiZ n#q wUmy;#jv#K cywo#q †d#j
Ges Zi#Ki Kv#jv `v#Mi m,,wó K#i| †jRvi
iwk¥i cÖfv#eI Zi#Ki Gifc ¶lwZ nq|

AwZ#e,wb iwk¥i cÖfv#e †Pv#Li Kx ai#bi ÿwZ n#Z cv#i

m~#h©i AwZ#e,wb iwk¥ †Pv#Li wUmy#K
¶wZMÖ' Ki#Z cv#i | Gi d#j †Pv#Li
bvbwea mgmÿ †hgb- †Pv#Li Qvwb,
Zzlv-cÖfvq webó `„wói gZ mgmÿ †`Lv
w`#Z cv#i | G iwk¥ gvbyl Qvov kkK RvZxq
cÖvYx Bu`y#ii †Pv#Li ¶wZ K#i | †mW
KzKz#ii †Qv#Li Qvwb mgmÿ GKwU
mvavib †ivM |

wewKib + _#K cÖwZiyvi

Dcvq

ÿwZKi wewKi#bi cÖfve n#Z gy³ _vKv
mKj Rx#ei GKvšÍ cÖ#qvRb| mvavibZ
`yÖfv#e cÖwZiyv g~jK eë-'v MÖnb
Kiv hvq|

K. ewnivMZ wewKib cÖwZ#iva|

L. AfšÍixb wewKib cÖwZ#iva|

wewKib †_ ‡K cÖwZiÿvi

Dcvq

ewnivMZ wewKib cÖwZ‡iva t Gai‡bi
wewKib n‡Z iÿvi Rb wZb cÖKv‡ii †KŠkj
†bqv †h‡Z cv‡i

G·‡cvRvi mgq n«vm Kiv t cÖvwbRM‡Zi
Dci wewKi‡bi cwigvb wbf©i K‡i wewKib
†Wv‡Ri nv‡ii Dci | ‡Wv‡Ri nvi x G·‡cvRvi
mgq = me©‡gvU †WvR | ZvB G·‡cvRv‡ii
mgq Kg n‡j wewKib Kg n‡e|

wewKib †_‡K cÖwZiÿvi

Dcvq

wewKib Drm n‡Z wbivc` `~iZj eRvq

ivLv t wewKib G·‡cvRvi wewKib Dr‡mi

`~i‡Zji mv‡_ n«vmcvq| Kv‡RB wewKib

Drm n‡Z GKwU wbw`©ó `~i‡Zj Ae⁻'vb

K‡i ev wevKib Dr‡mi `~iZj‡K e,,w× K‡i

wewKib †_‡K wbivc` _vKv hvq|

wewKib †_‡K cÖwZiÿvi

Dcvq

wewKib Drm‡K myiwÿZ ev wkjW
Kiv t wewKib‡K Dr‡mi KvQv KvwQ
Ae⁻v‡b mxwgZ ivLv nq, hv‡Z wewKib
cwi‡e‡k Qwo‡q co‡Z bv cv‡i| GRb[•]
wewKib Drm †_‡K wKQz `~‡i tiwW‡qkb
we‡gi MwZc‡_ GKwU †kvlK ivLv nq|

wewKib †_≠K cÖwZiÿvi

Dcvq

Afš́ixb wewKib cÖwZ#iva t Afš́ixb
wewKib cÖwZ#iv#ai eë⁻v wn#m#e wZb
ai#bi †KŠkj Aej^α^b Kiv †h#Z cv#i|

mywbw`©ó cwiKíbv Abyhvqx evm⁻vb
wbgv©b t cwi#e#ki mg⁻ wKQz#K
†ZRw⁻⊕eqgy³ Kiv cÖ#qvRb| ZvB Afš́ixb
wewKib c^awZ#iv#ai Rb^{..} evmM^{,,}#ni mwVK
bK&kv cÖbqb Ges †fw>U#jk#bi welqwUI
wewePbvq Avb†Z n#e|

wewKib †_#K cÖwZiyvi

Dcvq

kix#i Kfvi ev Kvc#oi eënvî t †ZRw⁻Æq
wewKib agx© jve#iUwi wkíca^awZôv#b
Kg©iZ eëw³#`i Kg©⁻'#j hvIqvi mgq
we#klfv#e wbwg©Z Ifvi#KvU, Uzwc,
†Møvfm BZv^{w`} eënvî Kiv cÖ#qvRb|
Avevi Kg©⁻'j ZvM Kivi Av#M eëüZ Gme
wRwbmcî Ly#j ivL#Z n#e| Gfv#e wewKi#bi
nvZ †_#K ZiK iyv †c#Z cv#i|

wewKib + _#K cÖwZiyvi

Dcvq

k!vmKv#h©i tÿ#Î c^awZ#iva g~jK eë~'v

t k!vm-cÖk!v#mi mv#_ wewKib cÖ#ek
Ki#Z cv#i| ZvB G#ÿ#Î gy#Lvk eënvi Kiv
+h#Z cv#i| `yB ai#bi gy#Lvk eënvi Kiv +h#Z
cv#i| wdëvi UvBc gy#Lvk iay KYv
cÖwZ#iva K#i Ges Ab`GK ai#bi gy#Lvk
cvIqv hvq, hv wewKib agx© KYv I Mv̄m
Dfq#KB cÖwZ#iva K#i|

†jRvi †mdwU mαú†K©

aviYv jvf Kiv

†jRvi †mdwU n†jv †jRv†ii wbivc` wWRvBb,
eënvī Ges Kv†h© cwibZ Kiv| hv†Z †jRvi
`yN©Ubvi SuzwK, cÖavbZ †Pv†Li Dci
AvNvZ Kgv†bv hvq| mvgvb`cwigv†b †jRvi
†Pv†Li `vqx ¶wZ mvab Ki†Z cv†i | ZvB
†jRvi wewμ I eënv†ii †¶†Î miKvwi
bxwZgvjv Abymib Ki†Z nq|

†jRvi †mdwU Gi bükbvj

÷vÛvW©

Laser Safety Gi bükbvj ÷vÛvW©My†jv wb†P †Iqv n†jvt

1| ANSI-Z136.1 Av†gwiKvi RvZxq †jRvi wbivc` eënv†ii gvb|

2| ANSI-Z136.3 nj wbivc` -^v`†mevq eëüZ †jRv†ii gvb|

3| ANSI-Z136.4 nj AcwUKv†j tiwW†qkb n†RvW© g~jvq†bi cÖ†qvRbxq c×wZ|

4| ANSI-Z136.5 nj wk†lv cÖwZôv†bi †jRv†ii wbivc` eënv†ii|

5| ANSI-Z136.6 AvDU†Wv†i †jRv†ii wbivc` eënv†ii|

6| ANSI-Z136.7 ni †Rv†ii c^a†UKwUf hš;cvwZi †Uw÷s I

wklbdj

- **wewKiY m^αú#K© aviYv jvf Ki#Z cvi#e|**
- **UV – Radiation m^αú#K© aviYv jvf Ki#Z cvi#e|**
- **wewKi#bi d#j Rxe#`#ni Kx ai#bi ýwZ n#Z cv#I Zv Rvb#Z cvi#e ?**
- **Rx#ei Dci wewKi#bi cÖfve m^αú#K© aviYv jvf Ki#Z cvi#e|**
- **gvbve#`#ni Zi#Ki Dci bb-AvqbvBwRs wewKi#bi cÖfve m^αú#K© aviYv jvf Ki#Z cvi#e|**
- **AwZ#e,wb iwkyi cÖfv#e †Pv#Li Kx ai#bi ýwZ n#Z cv#I Zv Rvb#Z cvi#e|**
- **wewKib †_#K cÖwZiyvi Dcvq Rvb#Z cvi#e|**
- **#jRvi †mdwU m^αú#K© aviYv jvf Ki#Z cvi#e|**
- **#jRvi †mdwU Gi bvkbyj :- vÛvW m^αú#K© Rvb#Z cvi#e|**

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